Tularemia

Report Immediately

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Francisella tularensis, the agent of tularemia, is a gram-negative bacterium. Two types of *F. tularensis* (A and B) occur in the United States. Type A organisms are classified as *F. tularensis* biovar *tularensis*, Type B organisms as *F. tularensis* biovar *palaearctica*.

B. Clinical Description

To a great extent, the nature of the illness in tularemia reflects the route of transmission as well as the virulence of the infecting strain. Almost all cases have a rapid onset of fever and lymphadenopathy (inflamed lymph nodes). Bacteremia (bacteria in the blood), should it develop, may last for 2 weeks if untreated, and lesions may contain the organism for up to a month. Illness usually falls into one of the following categories.

Ulceroglandular: Patients present with large, tender lymph nodes and a non-healing skin ulcer at the site of introduction of the bacteria, often accompanied by fatigue, chills and malaise.

Glandular: Patients present with one or more enlarged and painful lymph nodes that may become filled with pus.

Pneumonic (pulmonary): It occurs as a primary infection following inhalation of organisms, or secondary to bacteremia; resembles plague, with symptoms including non-productive cough, difficulty breathing and chest pain. Patchy bilateral infiltrates are seen on chest x-ray.

Typhoidal: This is a rare form of tularemia, with development of enlarged and inflamed mesenteric lymph nodes, septicemia, abdominal pain (often protracted), diarrhea, vomiting and gastrointestinal bleeding.

Oropharyngeal: After ingestion of bacteria in contaminated food or water, patients present with a painful pharyngitis (with our without ulceration), abdominal pain, diarrhea and vomiting.

Oculoglandular: Patients present with painful, pus-oozing conjunctivitis, with enlarged lymph nodes of the neck or near the ears, and usually with fever, chills and malaise.

Type A *F. tularensis* is more virulent; respiratory or ulceroglandular disease may result from contact with very few organisms. Type B organisms cause milder disease and require a higher dose to cause infection. The case-fatality rate in untreated typhoidal tularemia can be 30–60%. Pulmonary tularemia requires prompt treatment to prevent a fatal outcome. The case-fatality rate of Type A tularemia is 5–15% if untreated, primarily due to typhoidal or pulmonary disease.

C. Reservoirs

Type A infections are acquired from rabbits or *Dermacentor* ticks. Type B infections are associated with a wide variety of mammalian hosts; rabbits, hares, and some rodents (*e.g.*, beavers, muskrats) are particularly important. Domestic mammals, including livestock and cats, can acquire and spread the disease. Tick, mosquito

and fly vectors play a role in transmission. Humans are usually dead-end hosts (*i.e.*, they do not transmit the infection to others).

D. Modes of Transmission

Probably no bacterial agent has more diversified modes of transmission than *F. tularensis.* Infection can occur by direct contact (for example, while skinning/dressing wild game, especially rabbits and rodents); by arthropod bite (deer flies, horse flies, and ticks; the common dog tick, *Dermacentor variabilis,* is the most often implicated in the Northeast); by ingestion (*e.g.*, contaminated untreated drinking water, contaminated unpasteurized milk or contaminated undercooked rabbit or hare meat); or by inhalation (following exposure to cats with pulmonary tularemia, infectious aerosols generated while handling animal hides or cleaning areas with dried rodent carcasses, or infectious aerosols generated by winnowing, moving or loading contaminated grain). Less commonly, transmission may result from the bites or scratches of dogs, cats, carnivorous mammals or birds of prey that have killed or fed on infected animals. Laboratory infections can also occur; these frequently present as pulmonary or typhoidal tularemia. As noted above, the infection progresses from the portal of entry, thereby determining the kind of illness.

F. tularensis is quite hardy, surviving for weeks to months in cool water or mud, in tap water for up to 3 months, and in dry straw litter for as long as 6 months. Frozen (*e.g.,* in rabbit meat), it may remain infective for several years. Concentrations of chlorine attained in routine water purification are very effective at killing *F. tularensis,* as are trace amounts of copper sulfate or zinc.

E. Incubation Period

The incubation period for tularemia ranges from 1 to 14 days, but is usually 3–5 days.

F. Period of Communicability or Infectious Period

Tularemia is generally not directly transmitted from person-to-person. However, drainage from tularemic lesions is potentially infectious, and persons with the pulmonary form of tularemia may possibly aerosolize pathogenic bacteria during the course of their clinical illness. Flies can remain infective for 14 days and ticks throughout their lifetime. Rabbit meat frozen at 5°F (–15°C) can remain infective for over 3 years.

G. Epidemiology

Tularemia occurs throughout North America and in many parts of continental Europe, the former Soviet Union, China and Japan. In the United States, it occurs in all months of the year; incidence may be higher in adults in early winter (during rabbit-hunting season) and in children during the summer (when ticks and flies are abundant). Type A *F. tularensis*, found only in the United States, is common in rabbits (cottontail, jack and snowshoe) and is frequently transmitted by a tick bite. Type B *F. tularensis* strains are commonly found in mammals other than rabbits in North America.

H. Bioterrorist Potential

F. tularensis is considered a potential bioterrorist agent. If acquired and properly disseminated, *F. tularensis* could cause a serious public health challenge in terms of ability to limit the numbers of casualties and control other repercussions from such an attack.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. What to Report to the Massachusetts Department of Public Health

- Report any suspicion of tularemia called to your attention by a healthcare provider or any positive laboratory result pertaining to tularemia. Also report any potential exposure that may be a bioterrorist event. *Note:* See Section 3) C below for information on how to report a case.

B. Laboratory Testing Services Available

The Massachusetts State Laboratory Institute (SLI) provides confirmatory testing services. For antibody testing, serology should be sent to the Enteric Laboratory. For information on submission of serum for testing, call the Enteric Laboratory at (617) 983-6609. For culture of *F. tularensis*, specimens (tissue, aspirates, whole blood) may be sent to the Reference Laboratory. (The Reference Laboratory requests that all laboratories submit *all* isolates cultured for further identification to aid in the public health surveillance necessary for this infection.) For information on submitting specimens for culture, contact the Reference Laboratory at (617) 983-6607.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Reporting and Surveillance

- To identify where tularemia occurs in Massachusetts.
- To focus preventive and control measures.
- To determine whether the source of infection may be a major public health concern (*e.g.*, a water supply, group camp, rodent die-off) and stop transmission from such a source.
- To identify cases and clusters of human illness that may be associated with a bioterrorist event.

B. Laboratory and Healthcare Provider Reporting Requirements

Refer to the lists of reportable diseases (at the end of this manual's Introduction) for information.

Note: Due to the rarity and potential severity of tularemia, the MDPH requests that information about any suspect or known case of tularemia, or any potential exposure that may be a bioterrorist event, to be **immediately reported** to the local board of health where diagnosed. If this is not possible, call the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 (weekdays), or (617) 983-6200 (nights/weekends). A case is defined by the reporting criteria in Section 2) A above.

C. Local Board of Health Reporting and Follow-Up Responsibilities

1. **Reporting Requirements**

Massachusetts Department of Public Health (MDPH) regulations (*105 CMR 300.000*) stipulate that each local board of health (LBOH) must report the occurrence of any case of tularemia or potential exposure that may be a bioterrorist event. Refer to the *Local Board of Health Reporting Timeline* (at the end of this manual's introductory section) for information on prioritization and timeliness requirements of reporting and case investigation.

2. **Case Investigation**

   a. **The most important thing a LBOH can do if it learns of a suspect or confirmed case of tularemia, or any potential exposure that may be a bioterrorist event, is to call the MDPH immediately, any time of the day or night.** Daytime phone numbers of the Division of Epidemiology and Immunization are (617) 983-6800 and (888) 658-2850. The emergency phone number for nights and weekends is (617) 983-6200.

   b. Case investigation of tularemia in Massachusetts residents will be directed by the MDPH Division of Epidemiology and Immunization. If a bioterrorist event is suspected, the MDPH and other response authorities will work closely with LBOHs and provide instructions/information on how to proceed.

   c. Following immediate notification of the MDPH, the LBOH may be asked to assist in investigating cases that live within their communities, including gathering the following:
      1) The case's name, age, address, phone number, status (hospitalized, at home, deceased), and parent/guardian information, if applicable.
      2) The name and phone number of the hospital where the case is or was hospitalized.

3) The name and phone number of the case's attending physician.
4) The name and phone number of the infection control official at the hospital.
5) If the patient was seen by a healthcare provider before hospitalization, or was seen at more than one hospital, be sure to have these names and phone numbers as well.

d. Following immediate notification of the MDPH, the LBOH may be asked to assist in completing an official MDPH *Generic Disease Reporting Form* (in Appendix A). Most of the information required on the form can be obtained from the provider or the medical record. Use the following guidelines to assist you in completing the form:
   1) Record "Tularemia" as the disease being reported.
   2) Record the case's demographic information.
   3) Record the date of symptom onset, symptoms, date of diagnosis, hospitalization information (if applicable), and outcome of disease (*e.g.*, recovered, died). Try to be specific about which type of clinical illness applies (*e.g.*, ulceroglandular, pneumonic, typhoidal or oculo-glandular).
   4) Exposure history: use the approximate incubation period range for tularemia (1–14 days). Specifically, focus on the period beginning about 1 day prior to the case's onset date back to approximately 14 days before onset for the following exposures:
      a) Travel history: determine the date(s) and geographic area(s) traveled to by the case.
      b) Ask the case about any tick bites and direct contact with rabbits, rodents or other mammals.
      c) Record this information under the "Comments" sections at the bottom of the case report form.
   5) Complete the import status section to indicate where tularemia was acquired. If unsure, check "Unknown."
   6) Include any additional comments regarding the case.
   7) If you have made several attempts to obtain case information, but have been unsuccessful (*e.g.*, the case or healthcare provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason why it could not be filled out completely.

e. After completing the form, attach lab report(s) and fax or mail (in an envelope marked "Confidential") to the MDPH Division of Epidemiology and Immunization, Surveillance Program. The confidential fax number is (617) 983-6813. Call the Surveillance Program at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

   MDPH, Division of Epidemiology and Immunization
   Surveillance Program, Room 241
   305 South Street
   Jamaica Plain, MA 02130

f. Institution of disease control measures is an integral part of case investigation. It is the LBOH responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 4), Controlling Further Spread.

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*105 CMR 300.200*)

None.

B. Protection of Contacts of a Case

There is no immunization or prophylaxis for contacts of cases. Inpatient cases with draining lesions and those with the pulmonary form of the disease should be cared for in accordance with standard precautions. No restrictions are indicated for outpatient management.

C. Managing Special Situations

Reported Incidence Is Higher than Usual/Outbreak Suspected

If multiple cases of tularemia occur in individuals in your city/town, or if you suspect an outbreak, investigate to determine the source of infection and mode of transmission. A common exposure (such tick bites or unpasteurized milk) should be sought and applicable preventive or control measures should be instituted. Consult with the Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 as soon as possible. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several town lines and therefore be difficult to identify at a local level.

Note: Refer to the MDPH *Foodborne Illness Investigation and Control Reference Manual* for comprehensive information on investigating foodborne illness complaints and outbreaks. (Copies of this manual were distributed to local boards of health in 1997–98. It can also be located on the MDPH web site in PDF format at <http://www.magnet.state.ma.us/dph/fpp/refman.htm>.)

Note: If a bioterrorist event is suspected, the MDPH and other response authorities will work closely with local boards of health and provide instructions/information on how to proceed.

D. Preventive Measures

Environmental Measures

In general, environmental measures are not necessary. In some cases however, improvements to drinking water supplies may be warranted. Additionally, implicated food items must be removed from the environment. A decision about removing implicated food items from the environment can be made in consultation with the Division of Food and Drugs (DFD) or the Division of Epidemiology and Immunization. DFD is reachable at (617) 983-6712.

Personal Preventive Measures/Education

- Hunters should wear gloves when skinning wild game, keep their hands/gloves away from their eyes and thoroughly wash their hands after handling wild game carcasses. Wild game meat should be cooked "well done" (to at least 150°F/65°C).
- Drink only treated water when in wilderness areas to avoid bacterial and protozoan diseases that can be transmitted via surface water.
- Use DEET-based insect repellents to reduce the possibility of fly or tick bites. Use insect repellants properly. Repellants that contain DEET (diethyltoluamide) should be used in concentrations no higher than 15% for children and 30% for adults. Avoid overuse of DEET-based products; excess application can lead to adverse reactions. Remember, repellants should *never* be used on infants. Permethrin is a repellant that can only be applied onto clothing, *not* exposed skin.
- Avoid tick-infested areas. In areas where contact with ticks may occur, individuals should be advised of the following:
  - Wear long-sleeved shirts and long, light-colored pants tucked into socks or boots.
  - Stay on trails when walking or hiking and try to avoid high grass.
  - After each day spent in tick-infested areas, check yourself, your children, and your pets for ticks. Parts of the body ticks like most include the back of the knee, armpit, scalp, groin, and back of the neck.
  - Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out with steady pressure. Once removed, the tick should be drowned in rubbing alcohol or the toilet.

An *Insect Bites and Insect Repellents Fact Sheet* can be obtained from the Division of Epidemiology and Immunization or through the MDPH website at <http://www.state.ma.us/dph/>. Click on the "Publications" link and scroll down to the Fact Sheets section.

ADDITIONAL INFORMATION

The following is the formal Centers for Disease Control and Prevention (CDC) case definition for tularemia. It is provided for your information only and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2) A of this chapter. (CDC case definitions are used by the state health department and CDC to maintain uniform standards for national reporting.) For reporting a case to the MDPH always use the criteria outlined in Section 2) A.

Clinical description
An illness characterized by several distinct forms, including the following:

- Ulceroglandular (cutaneous ulcer with regional lymphadenopathy)
- Glandular (regional lymphadenopathy with no ulcer)
- Oculoglandular (conjunctivitis with preauricular lymphadenopathy)
- Oropharyngeal (stomatitis or pharyngitis or tonsillitis and cervical lymphadenopathy)
- Intestinal (intestinal pain, vomiting, and diarrhea)
- Pneumonic (primary pleuropulmonary disease)
- Typhoidal (febrile illness without early localizing signs and symptoms)

Clinical diagnosis is supported by evidence or history of a tick or deerfly bite, exposure to tissues of a mammalian host of *Francisella tularensis*, or exposure to potentially contaminated water.

Presumptive

- Elevated serum antibody titer(s) to *F. tularensis* antigen (without documented fourfold or greater change) in a patient with no history of tularemia vaccination *or*
- Detection of *F. tularensis* in a clinical specimen by fluorescent assay

Confirmatory

- Isolation of *F. tularensis* in a clinical specimen *or*
- Fourfold or greater change in serum antibody titer to *F. tularensis*

Case classification
Probable: a clinically compatible case with laboratory results indicative of presumptive infection

Confirmed: a clinically compatible case with confirmatory laboratory results

REFERENCES

American Academy of Pediatrics. *1997 Red Book: Report of the Committee on Infectious Diseases, 24th Edition*. Illinois, American Academy of Pediatrics, 1997.

CDC. Case Definitions for Infectious Conditions under Public Health Surveillance. *MMWR* 1997; 46:RR-10. Chin, J., ed.

Control of Communicable Diseases Manual, 17th Edition. Washington, DC, American Public Health Association, 2000.

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